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Method and Apparatus for Handling Metadata

Inventors:

Daniel J. Zigmond

Samuel Thomas Scott, III

Kevin T. Carle

ATTORNEY DOCKET NO. MS1-1899US

1 **TECHNICAL FIELD**

2 The systems and methods described herein relate to managing metadata
3 associated with content, such as program content.
4

5 **BACKGROUND**

6 A client device in a television-based system can receive data, such as video
7 data and audio data from a program distributor in the form of broadcast programs,
8 such as news programs, sitcoms, movies, sporting events, commercials, and any
9 other type of television-based information. Video data and audio data may also be
10 referred to as video content and audio content, respectively. A client device
11 includes, for example, a set-top box, a digital satellite receiver, a cable box, a
12 digital video recorder (DVR), and a television with a built-in receiver.

13 Various program data is available to identify programs scheduled to be
14 broadcast to viewers. This program data can be referred to as “metadata”. The
15 metadata associated with one or more programs may include information
16 displayed in a program guide such as program title, channel, and time of
17 broadcast. Metadata is typically associated with programs that will be broadcast at
18 a future time, such as programs scheduled to be broadcast during an upcoming
19 week. Programs that have already been broadcast may be recorded on a DVR or
20 other device. Metadata associated with these recorded programs may also be
21 recorded on the same DVR or other device. This recorded metadata is accurate as
22 of the time the broadcast of the associated program began. Often, this metadata is
23 incorrect or incomplete. For example, the duration of a program may be different
24 than the scheduled information due to the program being preempted or running
25 longer than expected.

1 When a user searches through numerous stored programs, metadata is
2 useful in locating programs of interest to the user. Using metadata that is not
3 accurate or complete may prevent the user from finding a desired program or may
4 identify programs that are not of interest to the user due to the inaccurate or
5 incomplete metadata used in the search. Thus, the use of inaccurate or incomplete
6 metadata can result in a frustrating and undesirable user experience.

7 8 **SUMMARY**

9 The systems and methods described herein manage metadata associated
10 with various content. In a particular embodiment, a video program is recorded
11 along with metadata associated with the video program. Upon receiving updated
12 metadata associated with the video program, the previously recorded metadata is
13 replaced with the updated metadata.

14 15 **BRIEF DESCRIPTION OF THE DRAWINGS**

16 Similar reference numbers are used throughout the figures to reference like
17 components and/or features.

18 Fig. 1 illustrates various components of an example architecture capable of
19 providing content to one or more client devices.

20 Fig. 2 illustrates an example display device and an example client device
21 capable of generating a listing of recorded programs for display on the display
22 device.

23 Fig. 3 is a flow diagram illustrating an embodiment of a procedure for
24 recording programs and recording metadata associated with the programs.

1 Fig. 4 is a flow diagram illustrating an embodiment of a procedure for
2 displaying previously recorded programs.

3 Figs. 5-8 illustrate examples of scheduled programs and the resulting
4 programs that are actually broadcast.

5 Fig. 9 is a flow diagram illustrating an embodiment of a procedure for
6 generating a listing of programs available for viewing.

7 Fig. 10 is a flow diagram illustrating an embodiment of a procedure for
8 handling updated metadata received from a data provider.

9 Fig. 11 illustrates an example listing of programs available for viewing.

10 Fig. 12 illustrates example metadata associated with a program prior to
11 broadcasting the program as well as updated metadata associated with the program
12 after the broadcast is completed.

13 Fig. 13 illustrates a television-based system that includes an example client
14 device.

15 16 **DETAILED DESCRIPTION**

17 The systems and methods described herein manage metadata associated
18 with various content, such as television programs, video-on-demand (VOD), and
19 advertisements. These systems and methods maintain timestamps associated with
20 various metadata to enable metadata to be updated or refreshed after it has been
21 delivered. A version number or other identifier may be used in place of a
22 timestamp to differentiate different between metadata. For example, when a client
23 device accesses a content server or other device, the content server delivers
24 updated metadata to the client device. Similarly, a data provider can provide
25 updated metadata to a server - the metadata being associated with content stored

1 by the server or accessible to the server. This updated metadata can correct
2 inaccuracies or incomplete data in previous versions of the metadata, thereby
3 improving the results of a user's search for programs of interest.

4 Television broadcasting systems (such as cable TV broadcasters or satellite
5 broadcasters) originate and communicate signals to customers from a headend (or
6 "head-end"). The headend contains equipment to broadcast signals and provide
7 other services to multiple customers. A headend interacts with the client devices
8 to provide content that is appropriate for the client device based on the settings,
9 preferences and account information associated with the client device. The
10 content may be provided to the client devices using any communication method,
11 any communication protocol, and any communication medium.

12 The systems and methods discussed herein are described with reference to
13 an environment in which content (and metadata associated with the content) is
14 distributed to client devices via a data communication network, such as the
15 Internet. These examples represent one possible environment in which the
16 systems and methods can be implemented. In other embodiments, any type of
17 system or architecture can be used to provide content to one or more client
18 devices. The content distributed to client devices can be any type of data, such as
19 television programs, video-on-demand, advertisements, program data, metadata,
20 and the like. Metadata may be any data related to any type of content. Metadata
21 examples include a program title, broadcast date and time, program rating,
22 program duration, program description, program commentary, program awards,
23 and the like.

24 Client devices of the type discussed herein range from clients with
25 substantial memory and processing resources, such as television-enabled personal

1 computers and television recorders equipped with hard-disks, to clients with little
2 or no memory and/or limited processing resources. Although particular examples
3 of client devices are discussed herein, any client device can be used with the
4 systems and methods described. Example client devices include personal
5 computers, DVD players, digital video recorders (DVRs), set top boxes, cable
6 boxes, satellite receivers, televisions, game consoles, and the like. As used herein,
7 the term “user” may also be referred to as “viewer”.

8 Although particular examples discussed herein are related to the broadcast
9 of video content such as television programs, the systems and methods described
10 herein can be applied to any type of content. Other types of content include radio
11 broadcasts, streamed audio and/or video data, an XML stream of stock price data
12 that can be converted to an on-screen ticker, and the like. Additionally, an
13 application that runs on a server and displays information on a client device
14 coupled to the server may use metadata to describe services offered by the
15 application. For example, initial metadata associated with audio data may identify
16 the audio data as a three hour block of “classical music”. Subsequent metadata
17 information may enhance the description to include, for example, the composer,
18 the symphony performing the music, and the historical significance of the music.

19 Fig. 1 illustrates various components of an example architecture 100
20 capable of providing content to one or more client devices 102. In this example
21 architecture 100, content (such as television programs, video-on-demand,
22 advertisements, and the like) is distributed via a data communication network 104,
23 such as the Internet. Architecture 100 provides two-way communication of data
24 between client devices and one or more servers or other devices via network 104.
25 In alternate embodiments, content is distributed to client devices 102 via a cable

1 network, radio frequency signals, over-the-air broadcast, satellite communication
2 systems, and the like.

3 In a particular embodiment, client devices 102 communicate with one or
4 more servers via network 104 using simple object access protocol (SOAP)
5 messages transported using hypertext transfer protocol (http), a protocol
6 commonly used by the World Wide Web. In other embodiments, any type of
7 protocol and/or messaging format can be used to exchange data between client
8 devices 102 and one or more servers.

9 Although not shown in Fig. 1, each client device 102 may be coupled to a
10 display device (such as a television, computer monitor, or projector), a recording
11 device (such as a VCR or DVR), or other device. Alternatively, one or more client
12 devices 102 may themselves be televisions or recording devices.

13 In the example of Fig. 1, network 104 may be any type of data
14 communication network and may include two or more different networks, such as
15 a local area network (LAN) and the Internet. A content server 112 is also coupled
16 to network 104. Content server 112 can perform various tasks, such as receiving
17 requests for data or content from client devices 102, providing program listings
18 and content to client devices 102, providing metadata to client devices 102, and
19 the like. A data storage device 114 is coupled to content server 112 and stores
20 various content, program metadata, program listings, and other information used
21 or handled by content server 112. The content stored by storage device 114
22 includes, for example, video-on-demand (VOD) content, advertisements, and
23 movie trailers.

24 A receiver 110 is coupled to content server 112 and storage device 114.
25 Receiver 110 receives broadcast content, program guide content, and other data

1 from a variety of sources. For example, receiver 110 can receive broadcast
2 content from a content broadcaster 106 via a cable network, radio frequency
3 signals, over-the-air broadcast, satellite communication systems, or any other
4 communication medium. Although one content broadcaster 106 is shown in Fig.
5 1, receiver 110 can be coupled to any number of content broadcasters using any
6 number of different communication mediums. Receiver 110 receives program
7 guide information from a program guide data provider 108. Program guide data
8 provider 108 provides information regarding upcoming programs scheduled to be
9 broadcast. This program guide data may be used by content server 112 and may
10 be communicated to one or more client devices 102. Although one program guide
11 data provider 108 is shown in Fig. 1, receiver 110 may be coupled to any number
12 of program guide data providers via any type of communication medium.

13 A data provider 116 is coupled to content server 112 and to network 104.
14 Data provider 116 provides metadata associated with any number of previously
15 broadcast programs. Data provider 116 may also provide program guide
16 information regarding upcoming programs scheduled to be broadcast (similar to
17 program guide data provider 108). Any number of different data providers 116
18 may be coupled to content server 112. Various other servers (not shown) may be
19 coupled to content server 112 and/or network 104 to communicate with content
20 server 112 and/or client devices 102.

21 Traditional television broadcasting systems (such as cable TV broadcasters,
22 over the air broadcasters, or satellite broadcasters) originate and communicate
23 signals to customers from a headend. In the architecture of Fig. 1, the headend
24 may be considered as the equipment used to communicate content and provide
25 other services to multiple customers (e.g., via client devices 102). The headend

1 interacts with the client devices 102 to provide content that is appropriate for the
2 client device based on the settings, preferences, and other information associated
3 with the client device. Referring to Fig. 1, any one or more of the following
4 devices may be considered part of the “headend”: content server 112, data storage
5 device 114, and receiver 110. In other embodiments, one or more additional
6 devices may be considered part of the headend.

7 Fig. 2 illustrates an example display device 204 and an example client
8 device 202 capable of generating a listing of recorded programs for display on the
9 display device. Display device 204 includes, for example, a television, a computer
10 monitor, a projector, and the like. Client device 202 receives content from a
11 content server (e.g., content server 112 in Fig. 1) or other content provider. Client
12 device 202 includes one or more processors 206, a program guide application 208,
13 and one or more memory devices 210. Processor(s) 206 include, for example,
14 microprocessors and controllers, which process various instructions to control the
15 operation of client device 202 and to communicate with other devices. Memory
16 device(s) 210 may be implemented, for example, as a disk drive, a random access
17 memory (RAM), a read-only memory (ROM), or a flash memory. Client device
18 202 may use memory device(s) 210 to store received programs, program schedule
19 information, program metadata, configuration information, and the like.

20 Program guide application 208 executes on processor(s) 206 and can be
21 stored as computer-executable instructions in non-volatile memory (not shown) or
22 client device 202. Program guide application 208 generates a recorded program
23 guide 212 that can be displayed on display device 204. For example, recorded
24 program guide 212 may be displayed in the on-screen display (OSD) layer
25 generated by client device 202. Alternatively, recorded program guide 212 can be

1 displayed in another layer generated by client device 202, such as the video layer.
2 Although program guide application 208 is illustrated and described herein as a
3 single application configured to generate recorded program guide 212, program
4 guide application 208 can be implemented as multiple component applications
5 distributed such that each performs one or more functions.

6 Recorded program guide 212 allows a viewer to see what programs have
7 been recorded by client device 202 and/or other devices, and are available for
8 viewing. In one embodiment, recorded program guide 212 operates in an
9 interactive mode in which the information displayed in recorded program guide
10 212 is manipulated by pressing control buttons (e.g., arrow buttons) on a remote
11 control device or other input device. Alternatively, program guide application 208
12 may generate a program guide that identifies programs that are scheduled to be
13 broadcast on particular channels at particular times.

14 In the example of Fig. 2, recorded program guide 212 displays information
15 associated with five previously recorded programs in a grid arrangement. In
16 alternate embodiments, information associated with previously recorded programs
17 can be arranged in any manner, and may include textual information, graphical
18 information, or any other information associated with the programs. A header 214
19 identifies the type of data displayed in the grid below the header, such as the date
20 the program was recorded, the title of the recorded program, and the length of the
21 recorded program. Information regarding the five previously recorded programs is
22 displayed below header 214. A viewer may interact with the recorded program
23 guide 212 to scroll the guide to display information regarding other recorded
24 programs and/or display additional information associated with the recorded
25 programs. In alternate embodiments, recorded program guide 212 may display

1 information associated with any number of recorded programs. Further, alternate
2 embodiments may display different information (e.g., program description or
3 program rating) associated with the recorded programs.

4 Fig. 3 is a flow diagram illustrating an embodiment of a procedure 300 for
5 recording programs and recording metadata associated with the programs.

6 Initially, a request is received to record a program (block 302). For example, the
7 request may be generated by a viewer through an electronic program guide (EPG)
8 presented to the viewer through a client device. Alternatively, the request may be
9 generated in response to an advertisement for the program, or by the viewer
10 entering a channel and time period associated with the program to be recorded. In
11 a particular embodiment, a viewer merely presses a "Record" button on a remote
12 control device to begin recording the currently tuned channel.

13 The requested program is recorded at the appropriate time (block 304). If
14 the record time is in the future, the device automatically tunes to the appropriate
15 channel and begin recording at the designated time. The program may be recorded
16 by the client device, such as a DVR or a VCR. Metadata associated with the
17 recorded program is also recorded (block 306) by the client device or other
18 recording device. Alternatively, the program and/or the metadata associated with
19 the program may be recorded on a separate device coupled to the client device via
20 a communication link, such as a network communication link.

21 After recording of the program is complete, procedure 300 identifies
22 program details associated with the recorded program (block 308). For example,
23 the procedure may retrieve metadata associated with the recorded program from a
24 content server, a data provider, or other data source. Alternatively, the procedure
25 may identify program details (such as the actual duration of the recorded program)

1 based on the recorded program itself or based on information received along with
2 the program content. At block 310, the procedure determines whether the program
3 details identified after the program is complete differ from the metadata previously
4 recorded in block 306. If so, procedure 300 updates the previously recorded
5 metadata with the new metadata identified after recording of the program is
6 complete (block 312).

7 In a particular embodiment, the metadata associated with the recorded
8 program is stored on the same device as the recorded program. In other
9 embodiments, the metadata associated with the recorded program is stored on a
10 separate device, such as a separate storage device or a separate client device.

11 In one embodiment, program content and associated metadata is stored on a
12 DVR. When recording certain programs, such as sporting events, that may have a
13 variable program length, the DVR typically records for a period of time that
14 exceeds the scheduled program length. For example, if a football game is
15 scheduled for three hours, the DVR may record an additional hour (four hours
16 total) to be sure the entire game is recorded if the length of the game exceeds three
17 hours. However, if the game duration is less than four hours, unwanted content is
18 stored on the DVR, which uses valuable storage space. In this situation, the
19 updated metadata may indicate the exact length (e.g., duration in hours, minutes,
20 and/or seconds) of the game. The DVR can then delete any content recorded after
21 the game ended, thereby releasing storage space for other program content.

22 Fig. 4 is a flow diagram illustrating an embodiment of a procedure 400 for
23 displaying previously recorded programs. Initially, a client device receives a
24 request to display previously recorded programs (block 402). These previously
25 recorded programs may be stored on the client device or on another device

1 coupled to the client device. The client device identifies the recorded programs
2 available for viewing (block 404). The identified programs may include all
3 recorded programs stored on the client device. The client device then checks for
4 updated metadata associated with each of the recorded programs (block 406).
5 Alternatively, the client device may check for updated metadata associated with
6 the recorded programs to be displayed to the viewer. For example, if an initial
7 listing of ten programs will be displayed to the user, the client device may check
8 for updated metadata associated with those ten programs.

9 If updated metadata is available for one or more of the recorded programs
10 (block 408), the client device retrieves the updated metadata associated with the
11 recorded programs (block 410). The client device then displays the recorded
12 programs using the metadata associated with the recorded programs (block 412).
13 Updated metadata may include revised information regarding a program, such as a
14 revised program length (shorter or longer than originally scheduled) or an updated
15 program rating (e.g., from TV-14 to TV-M, or from previously unrated to TV-Y).
16 Updated metadata may also include additional data regarding a program, such as
17 the results of a sporting event, awards received after the program is broadcast, and
18 the like. The display of recorded programs may be similar to the listing of
19 recorded programs shown in Fig. 2.

20 A client device and/or a content server may purchase updated metadata
21 related to one or more programs (or categories of programs), or may subscribe to a
22 metadata update service that provides updated metadata on a regular basis. In one
23 embodiment, a client device accesses a content server periodically (e.g., daily) to
24 receive updated metadata. Similarly, the content server can periodically access a
25 data provider to receive updated metadata. In other embodiments, a client device

1 automatically receives metadata updates from the content server. Similarly the
2 content server can automatically receive metadata updates from the data provider.

3 Figs. 5-8 illustrate examples of scheduled programs and the resulting
4 programs that are actually broadcast. For example, Fig. 5 illustrates a scheduled
5 broadcast of programs 502 on a particular channel during a particular time period
6 (2:00 pm – 5:00 pm). This scheduled broadcast information is available prior to
7 the program broadcast (e.g., via an electronic program guide or other source of
8 program information). The actual broadcast of programs 504 shows that the actual
9 broadcast of programs was different from the scheduled broadcast information.
10 For example, Program A ran for 1.5 hours instead of 1.0 hour and Program B was
11 shortened from 1.0 hour to 0.5 hours. This situation may occur, for example,
12 when Program A is a sporting event (or other live event) that has a variable ending
13 time. In the example of Fig. 5, Program A ran longer than anticipated and the
14 broadcaster shortened the duration of Program B to compensate (e.g., joining
15 Program B “already in progress”). The actual broadcast of Program C was
16 consistent with the scheduled broadcast information. In situation of Fig. 5, it is
17 desirable to update the program metadata associated with Program A and Program
18 B after the programs are broadcast so that a future display of recorded program
19 listings is generated accurately. If the recorded program listing relies on old
20 metadata (e.g., the scheduled broadcast information), the recorded program listing
21 will be generated with inaccurate data. Applications, such as a program search
22 application, rely on the accuracy of the metadata to produce quality search results.
23 Similarly, applications such as a DVR application rely on the accuracy of the
24 metadata to manage disk storage space.
25

1 Fig. 6 illustrates a scheduled broadcast of programs 602 on a particular
2 channel during a particular time period and an actual broadcast of programs 604
3 showing that the actual broadcast of programs was different from the scheduled
4 broadcast information. In this example, the duration of Program A was much
5 shorter than indicated by the scheduled broadcast information. This may occur
6 due to a cancelled event (e.g., a rained-out baseball game) or a problem retrieving,
7 handling, or broadcasting the scheduled program. In this situation, Program B
8 started early and ran for a longer duration. The actual broadcast of Program C was
9 consistent with the scheduled broadcast information.

10 Fig. 7 illustrates a scheduled broadcast of programs 702 on a particular
11 channel during a particular time period and an actual broadcast of programs 704
12 showing that the actual broadcast of programs was different from the scheduled
13 broadcast information. In this example, the actual broadcast of Program A was
14 consistent with the scheduled broadcast information. However, the actual duration
15 of Program B was shorter than indicated in the scheduled broadcast information.
16 Additionally, due to the shortened length of Program B, Program C started earlier
17 than indicated in the scheduled broadcast information. An additional program
18 (Program D) was broadcast after Program C. The broadcast of Program D was not
19 indicated in the scheduled broadcast information. For example, Program D may
20 have been selected to fill the time created by the shortened length of Program B.
21 This selection of Program D may have been made without any advance notice to
22 viewers, broadcasters, or other individuals or entities.

23 Fig. 8 illustrates a scheduled broadcast of programs 802 on a particular
24 channel during a particular time period. In this example, conflicting program
25 metadata was received regarding the actual broadcast of programs. A first set of

1 metadata 804 indicates that Program A ran longer than scheduled and Program B
2 was shortened accordingly. This first set of metadata 804 also indicates that
3 Program C was consistent with the scheduled broadcast information. A second set
4 of metadata 806 indicates that Program A was consistent with the scheduled
5 broadcast information, but Program B ran longer than scheduled. Additionally, the
6 duration of Program C was shortened to adjust for the additional length of
7 Program B.

8 In the example of Fig. 8, the two different sets of metadata 804 and 806
9 may have been generated by different data providers, or generated at different
10 times (e.g., the correct metadata was generated at a later time after the correct
11 broadcast information was verified). In one embodiment, conflicts between two or
12 more sets of metadata can be resolved by selecting the metadata with the most
13 recent timestamp and discarding the other metadata. In another embodiment, both
14 sets of metadata are maintained and information from both sets of metadata is
15 displayed, for example, in an available program listing simultaneously. In a
16 further embodiment, all conflicting sets of metadata are ignored, which may result
17 in “voids” in an available program listing until a corrected set of metadata is
18 received. In another embodiment, data providers may be assigned a relative
19 ranking, such as a letter grade from A to F. Data providers with higher letter
20 grades are assumed to have more accurate and complete information in cases
21 where conflicts exist.

22 Fig. 9 is a flow diagram illustrating an embodiment of a procedure 900 for
23 generating a listing of programs available for viewing. Initially, a request is
24 received to display a listing of programs available for viewing (block 902). This
25 request may be received, for example, by a client device, a content server, or other

1 device. The request may specify a particular type of program (sports, movies,
2 etc.), a particular rating (G or TV-14), one or more keywords, or other information
3 to filter the programs displayed. The procedure then identifies programs to display
4 in response to the request (block 904), e.g., using the filtering information
5 specified in the request. Procedure 900 then identifies metadata associated with
6 the identified programs (block 906). This metadata may be stored locally on, for
7 example, the client device or may be stored on a content server or other device.
8 The metadata associated with a particular program may include information
9 generated after the program was broadcast, such as a final score, reviews of the
10 program, or commentary regarding the program.

11 The procedure continues by generating a listing of programs available for
12 viewing using the metadata associated with the programs (block 908). Finally, the
13 generated listing of programs available for viewing is provided to the requesting
14 device (block 910). This listing of programs may include some or all of the
15 metadata associated with the programs. For example, a summary of the program
16 may be displayed, but there may be insufficient space to display an entire
17 commentary. In this example, a viewer could activate a "Full Commentary"
18 button included in the available program guide to display the entire commentary
19 associated with a particular program.

20 Fig. 10 is a flow diagram illustrating an embodiment of a procedure 1000
21 for handling updated metadata received from a data provider. Procedure 1000
22 may be implemented by a client device, a content server, or other device. Initially,
23 the procedure receives updated metadata from a data provider (block 1002). The
24 procedure then identifies a timestamp associated with the updated metadata (block
25 1004). The timestamp may be a date and/or time of publication, a revision

1 number, or other indicator of a unique version associated with the metadata.
2 Procedure 1000 continues by identifying the previously stored metadata (block
3 1006), i.e., the most current metadata received prior to receiving the updated
4 metadata in block 1002. The procedure also identifies a timestamp associated with
5 the previously stored metadata (block 1008). Next, a determination is made
6 regarding whether the timestamp associated with the updated metadata is more
7 current than the timestamp associated with the previously stored metadata (block
8 1010). If the timestamp associated with the updated metadata is more current than
9 the timestamp associated with the previously stored metadata, then the previously
10 stored metadata is replaced with the updated metadata (block 1012). However, if
11 the timestamp associated with the updated metadata is older than the timestamp
12 associated with the previously stored metadata, the updated metadata is discarded
13 (block 1014), thereby maintaining the previously stored metadata as the current
14 metadata used by the system.

15 Fig. 11 illustrates an example listing of programs available for viewing
16 1102. Available programs listing 1102 displays programs that are available for
17 viewing as well as additional information about those programs, such as a rating
18 associated with the program and the length of the program. In one embodiment,
19 available programs listing 1102 operates in an interactive mode in which the
20 displayed information can be manipulated by pressing control buttons (e.g., arrow
21 buttons) on a remote control device or other input device.

22 In the example of Fig. 11, available programs listing 1102 displays
23 information associated with six programs in a grid arrangement. A header 1104
24 identifies the type of data displayed in the grid below the header, such as the title
25 of the program, a rating associated with the program, and the length of the

1 program. Information regarding the six programs is displayed in the grid below
2 header 1104. A viewer may interact with the available programs listing 1102 to
3 scroll the guide to display information regarding other programs available for
4 viewing and/or display additional information associated with the recorded
5 programs. In alternate embodiments, available programs listing 1102 may display
6 information associated with any number of recorded programs. Further, alternate
7 embodiments may display different information (e.g., program description or
8 program awards) associated with the programs.

9 Fig. 12 illustrates example metadata associated with a program prior to
10 broadcasting the program as well as updated metadata associated with the program
11 after the broadcast is completed. A first set of metadata 1202 is an example of
12 metadata that may be available prior to the broadcast of a program. Metadata
13 1202 includes a title of the program, a broadcast channel, the date and time of the
14 program's broadcast, a brief description of the program, a few keywords
15 associated with the program and a short comment regarding the program. Such
16 information is typical for a program that has yet to be broadcast. Metadata 1202
17 may be stored in a database, a content server, a client device, or any other device.
18 The metadata can be stored in any format using any data structure.

19 Metadata 1204 includes additional information and updated information as
20 compared to metadata 1202. For example, the program was a basketball game that
21 had two overtime sessions, which caused the program to run longer than
22 scheduled. Metadata 1204 correctly identifies the length of the program as 2 hours
23 35 minutes whereas metadata 1202 identifies the scheduled length of 2 hours.
24 Additional information regarding the game is included in metadata 1204, such as
25 the game being a double overtime game, the winner of the game, a player setting a

1 new scoring record, as well as other highlights and comments that are available
2 after the game is finished. Metadata 1204 may be further updated at a future time
3 to include additional information regarding the program, such as having the
4 program added to a “100 best games of 2004” list or adding further comments or
5 reviews of the program that are released at a later time.

6 Metadata 1202 and 1204 represent examples of the types of metadata that
7 may be associated with a program. In other embodiments, any type of data can be
8 associated with a particular program. Further, metadata can be updated and/or
9 revised at any time prior to the broadcast of the program, during the broadcast of
10 the program, or after the broadcast of the program.

11 Fig. 13 illustrates a television-based system 1300 that includes an example
12 client device. System 1300 also includes a display device 1304 to display, for
13 example, video content, recorded program listings, available program listings, and
14 other data. Client device 1302 can be implemented as a set-top box, a satellite
15 receiver, a TV recorder with a hard disk, a digital video recorder (DVR) and
16 playback system, a game console, an information appliance, and as any number of
17 similar embodiments.

18 Client device 1302 includes one or more tuners 1306 which are
19 representative of one or more in-band tuners that tune to various frequencies or
20 channels to receive television signals, as well as an out-of-band tuner that tunes to
21 the broadcast channel over which program data is broadcast to client device 1302.
22 Tuners 1306 may include hardware-based tuners and/or digital tuners capable of
23 “tuning” or identifying IP-based digital streams of data. IP-based digital streams
24 serve a similar function as tuners, but are used in an IP environment for the
25 delivery of content (e.g., the unicast delivery of content). Client device 1302 also

1 includes one or more processors 1308 (e.g., any of microprocessors, controllers,
2 and the like) which process various instructions to control the operation of client
3 device 1302 and to communicate with other electronic and computing devices.

4 Client device 1302 can be implemented with one or more memory
5 components, examples of which include a random access memory (RAM) 1310,
6 mass storage media 1312, a disk drive 1314, and a non-volatile memory 1316
7 (e.g., ROM, Flash, EPROM, EEPROM, etc.). Disk drive 1314 can include any
8 type of magnetic or optical storage device, such as a hard disk drive, a magnetic
9 tape, a rewriteable compact disc, a DVD, and the like. The one or more memory
10 components store various information and/or data such as received content,
11 program metadata 1318, recorded programs 1320, configuration information for
12 client device 1302, and/or graphical user interface information. Alternative
13 implementations of client device 1302 can include a range of processing and
14 memory capabilities, and may include any number of differing memory
15 components than those illustrated in Fig. 13. For example, full-resource clients
16 can be implemented with substantial memory and processing resources, whereas
17 low-resource clients may have limited processing and memory capabilities.

18 An operating system 1322 and one or more application programs 1324 can
19 be stored in non-volatile memory 1316 and executed on processor(s) 1308 to
20 provide a runtime environment. A runtime environment facilitates extensibility of
21 client device 1302 by allowing various interfaces to be defined that, in turn, allow
22 application programs 1324 to interact with client device 1302. The application
23 programs 1324 can include a browser to browse the Web (e.g., "World Wide
24 Web"), an email program to facilitate electronic mail, a program to display and
25

1 search for available programs and video-on-demand content, and any number of
2 other application programs.

3 A program guide application 1326 that executes on processor(s) 1308 is
4 also stored in non-volatile memory 1316 and is implemented to generate a
5 program guide for display. Using program guide application 1326, the viewer can
6 look at schedules of current and future programming, set reminders for upcoming
7 programs, and/or enter instructions to record one or more programs.

8 Client device 1302 further includes one or more communication interfaces
9 1328 and a PSTN, DSL, cable, or other type of modem 1330. A communication
10 interface 1328 can be implemented as a serial and/or parallel interface, as a
11 wireless interface, and/or as any other type of network interface. A wireless
12 interface enables client device 1302 to receive control input commands 1332 and
13 other information from a user-operated input device, such as from a remote control
14 device 1334 or from another infrared (IR), 802.11, Bluetooth, or similar RF input
15 device. Input devices can include a wireless keyboard or another handheld input
16 device 1336 such as a personal digital assistant (PDA), handheld computer,
17 wireless phone, or the like. A network interface and a serial and/or parallel
18 interface enables client device 1302 to interact and communicate with other
19 electronic and computing devices via various communication links. Modem 1330
20 facilitates client device 1302 communication with other electronic and computing
21 devices via a conventional telephone line, a DSL connection, cable, and/or other
22 type of connection.

23 Client device 1302 also includes a content processor 1338 which can
24 include a video decoder and/or additional processors to receive, process, and
25 decode broadcast video signals and program data, such as NTSC, PAL, SECAM,

1 or other television system analog video signals, as well as DVB, ATSC, or other
2 television system digital video signals. For example, content processor 1338 can
3 include an MPEG-2 or MPEG-4 (Moving Pictures Experts Group) decoder that
4 decodes MPEG-encoded video content and/or image data. The systems described
5 herein can be implemented for any type of video encoding format as well as for
6 data and/or content streams that are not encoded.

7 Typically, video content and program data includes video data and
8 corresponding audio data. Content processor 1338 generates video and/or display
9 content that is formatted for display on display device 1304, and generates
10 decoded audio data that is formatted for presentation by a presentation device,
11 such as one or more speakers (not shown) in display device 1304. Content
12 processor 1338 can include a display controller (not shown) that processes the
13 video and/or display content to display corresponding images on display device
14 1304. A display controller can include a graphics processor, microcontroller,
15 integrated circuit, and/or similar video processing component to process the
16 images.

17 Client device 1302 also includes an audio and/or video output 1340 that
18 provides the audio, video, and/or display signals to television 1304 or to other
19 devices that process and/or display, or otherwise render, the audio and video data.
20 Video signals and audio signals can be communicated from client device 1302 to
21 television 1304 via an RF (radio frequency) link, S-video link, composite video
22 link, component video link, or other similar communication link.

23 Although shown separately, some of the components of client device 1302
24 may be implemented in an application specific integrated circuit (ASIC).
25 Additionally, a system bus (not shown) typically connects the various components

1 within client device 1302. A system bus can be implemented as one or more of
2 any of several types of bus structures, including a memory bus or memory
3 controller, a peripheral bus, an accelerated graphics port, or a local bus using any
4 of a variety of bus architectures. By way of example, such architectures can
5 include an Industry Standard Architecture (ISA) bus, a Micro Channel
6 Architecture (MCA) bus, an Enhanced ISA (EISA) bus, a Video Electronics
7 Standards Association (VESA) local bus, and a Peripheral Component
8 Interconnects (PCI) bus also known as a Mezzanine bus.

9 Although the description above uses language that is specific to structural
10 features and/or methodological acts, it is to be understood that the invention
11 defined in the appended claims is not limited to the specific features or acts
12 described. Rather, the specific features and acts are disclosed as exemplary forms
13 of implementing the invention.
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